STIN 526

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August 2024

Suppliers' Trial Information Note

For The Openreach Network

1Gbps SyncE/PTP Street Access Trial Product

STIN Type

Service & Interface Description

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CONTENTS

1. INTRODUCTION 3
2. SERVICE OUTLINE 3
2.1 GENERAL 3
3. INTERFACE DESCRIPTIONS 4
3.1 GENERAL 4
3.2 OPTICAL CONNECTOR (HEADEND NTE) 4
3.3 CONNECTOR TYPE (REMOTE NTE) 4
3.4 TRANSMISSION 5
3.5 FRAME FORWARDING BEHAVIOUR 5
3.6 STREET ACCESS TRANSPARENCY RESTRICTIONS 5
3.7 AUTO-NEGOTIATION AND DUPLEX SETTINGS 5
3.8 NETWORK LINK LOSS FORWARDING 5
3.9 USER-USER LINK LOSS FORWARDING 6
3.10 ETHERNET TRAFFIC 6
4. ENVIRONMENTAL SPECIFICATIONS 6
4.1 GENERAL 6
5. POWER SUPPLY & INSTALLATION 7
5.1 GENERAL 7
  5.1.1 Headend NTE 7
  5.1.2 Remote end NTE 7
5.2 INSTALLATION AND TESTING 7
  5.2.1 Headend NTE 7
  5.2.2 AC Power connection – Head end NTE only 7
  5.2.3 DC Power Connection – Head end NTE only 7
5.3 REMOTE END NTE USED IN STREET FURNITURE ONLY 8
6. SYNCHRONISATION 10
6.1 TIMING INPUT OPTIONS 12
7. REFERENCES 13
8. ABBREVIATIONS 14
9. HISTORY 15

FIGURES

FIGURE 1. SIMPLIFIED NETWORK DIAGRAM 4

1. Introduction

This Suppliers' Trial Information Note (STIN) describes the interface provided with the Openreach 1 Gbit/s Street Access services, referred to as "Street Access 1G". Also provided is some general information on the Street Access product family and some physical aspects of the NTE being deployed for Street Access 1G customer orders.

Street Access services are new "active" 1Gbps point-to-point dedicated data circuits that are permanently connected and available 24 hours a day, 365 days a year. Street Access provides secure links between combinations of end user sites effectively street furniture/lamp posts, and Communications Providers' (CPs') sites and/or BT exchanges, providing "full on path support" for phase synchronisation.

Any specific technology mentioned in this document is current as of today. However, it may be subject to change in the future. Should the specification of the interface be changed, this will be notified by a new issue of this STIN. Openreach reserves the right to adapt technology to deliver Street Access as new developments are made. All services are delivered over an uncontended transmission path.

It should be noted that the information contained within this STIN might be subject to change due to either the results of Openreach testing, or due to feedback from trial participants. Please check with the https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do site to ensure you have the latest version of this document.

Further information regarding the trial and pilot network test and Proof of Concept facilities can be obtained by contacting your Openreach Sales and Relationship Manager.

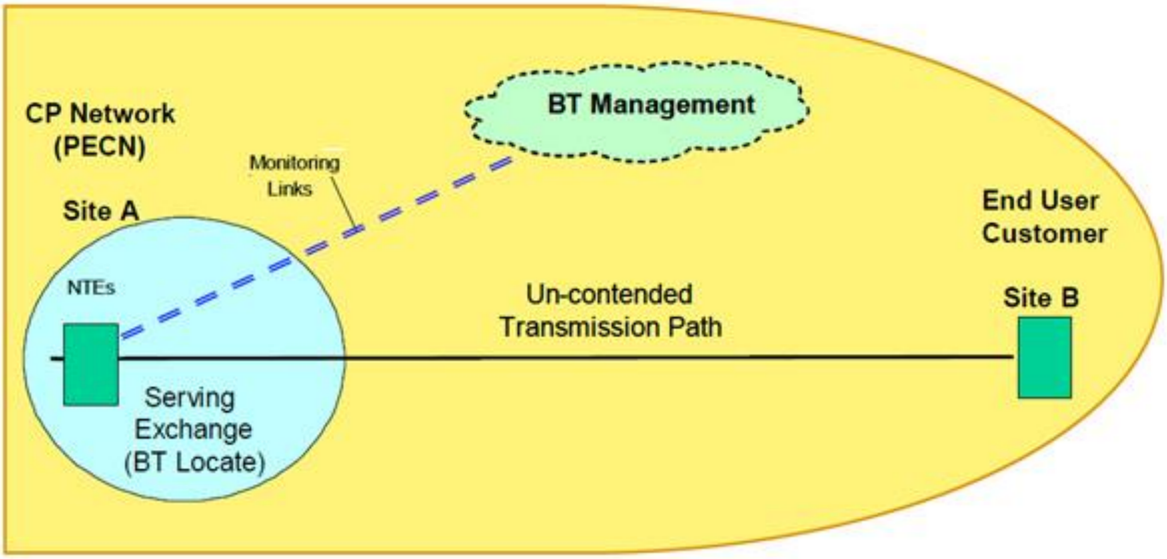
2. Service Outline

2.1 General

The Street Access 1G service operates at a speed of 1000 Mbps in full duplex mode between sites.

A schematic of the Street Access 1G service is shown in Figure 1. Site A is usually a BT Exchange end, Site B is usually housed in street furniture.

Figure 1



It is envisaged that CPs / customers will use this service for the interconnection of Gigabit Ethernet between street furniture mounted devices and a Openreach exchange or CP PoP site.

3. Interface Descriptions

3.1 General

Gigabit Ethernet conforms to the IEEE 802.3 standard. Autoneg is enabled at both ends. Local end presentation to the Communication Provider (CP) is via singlemode or multimode dual LC optical presentation. The remote site presentation to the CP is via RJ45 connection only, 1000Base-T, Master. Hence the customer must set their interface to Auto 1000Full Slave. Auto MIDX is active on the RJ45 handover facing the CP. CAT5E RJ45 cables must be used when connecting up to this service.

3.2 Optical Connector (Headend NTE)

The interface is the Network Termination Point (NTP), i.e. the point of connection on the Openreach Network Terminating Equipment (NTE) for connecting Customer Premise Equipment. (CPE)

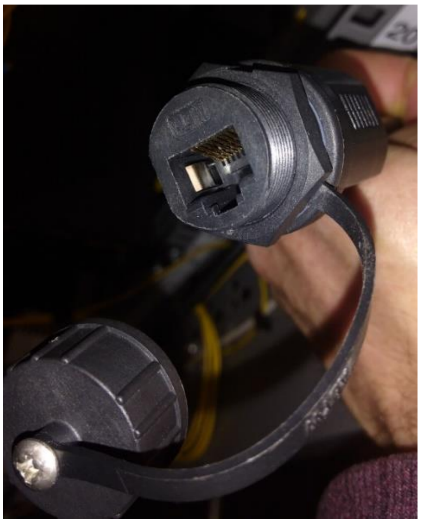
Client Interface will always be a Dual LC type 1000BaseSX or LX fibre interface optical port. The CP / customer provides the fibre patch connectors between NTE and CP equipment/CPE. The maximum fibre length between the NTE and CP equipment/CPE is 220 metres for 850nm multimode ports if 62.5/125 micron optical patch cords are used. For 1310nm single-mode ports, the maximum fibre length is 10 kilometres when a 9/125 micron optical patch cable is used.

Attention is drawn to the Intellectual Property Rights (IPRs) set out in the preface of this agreed International standard. It is the responsibility of the supplier of the CP equipment or CPE to ensure that they have the necessary rights from the owner of the IPR.

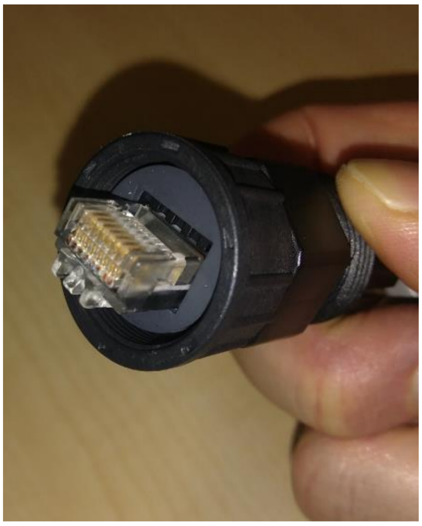
3.3 Connector Type (Remote NTE)

The remote end is an Optitap RJ45 handover. The customer should present a male RJ45 Optitap connector for conection into the Street Acces service. The female presentation for the Openreach service is pictured below left, the customer should provide connector below right.

RJ45 Presentation from Openreach NTE



Required RJ45 connection from customer



3.4 Transmission

Note: The definition of frame length includes the 4-byte CRC but does not include any preamble.

The NTE is capable of transporting IEEE 802.1q[2] and IEEE 802.1ad VLAN-tagged frames of 1522 bytes in length, as well as being capable of transporting frames of up to 2000 bytes in length to maintain compatibility with a large number of vendor proprietary frame tagging formats.

In-order to enhance the customer experience, we propose to offer 99.9% throughput for all frame sizes with ability to send untagged, single tagged and double tagged frames. Customers will be able to send outer VLAN tags in range 0-4093 (both inclusive). VLAN 4094 will be used for managing the Street Access NTE and thus cannot be used by the customer.

The NTE does not have the capability to intercept and/or view ‘customer data’.

3.5 Frame Forwarding Behaviour

The Street Access service does not include IEEE 802.1d[2] Bridging functionality, [which would allow for the Learning and Filtering of traffic packets destined for those hosts connected at the local end]. Therefore Ethernet frames that would normally be filtered by IEEE 802.1d[2] bridging functionality, are instead forwarded across the Street Access link.

3.6 Street Access Transparency Restrictions

All Ethernet frames are passed across the Street Access link, other than the following list of known exceptions:-

1. Transport of EFM OAM PDUs as defined by IEEE 802.3[1] over Street Access is not supported.
2. The Street Access service uses EFM OAM PDUs internally for the purposes of OAM. And as per the IEEE802.3[1] standards defined behaviour for EFM equipment, the end to end transport of customer EFM OAM PDUs over the Street Access link is blocked.
3. Transport of Ethernet flow control / Pause frames over Street Access is not supported
4. Transport of Auto-negotiation messages over the Street Access link is not supported.
5. Auto-negotiation messages are exchanged and terminated between the NTE’s client interface and the customer equipment to which it is directly connected.

3.7 Auto-Negotiation and Duplex Settings

The NTE customer interface will require customer equipment Ethernet interface to be set to Auto-negotiate. The NTE will advertise its speed and duplex settings, however the NTE will not allow speed or duplex settings to be set by customer equipment. Half duplex is not supported. At the remote site, auto-negotiation required for the 1000M RJ45 handover, as specified in IEEE 802.3[1]. Additionally, at the remote site, the customer must set their equipment to operate at as “Auto 1000 Full Link Slave”, to ensure the timing messages are propagated correctly.

3.8 Network Link Loss Forwarding

If a break is detected on the Openreach network link, the customer side connection at the local end only will be forced hard down (i.e. light will not emanate towards the customer from the port at the local end, and the RJ45 port will be powered off at the remote site). This continues until such time as the network break is repaired.

Please note:- Access ports that take in the Sync timing feed from the customer will not have port down LLF fault propagation, because this would disconnect the incoming timing feed, that is used for other services.

3.9 User-User Link Loss Forwarding

User-User Link Loss Forwarding (Fault propagation) is an optional configuration at time of order and available as unidirectional only. Note any disconnection/deactivation of Access ports will result in Sync going into holdover state – with wait to restore recovery period once the Access link is up again.

Please note:- The Access ports that take in the Sync timing feed from the customer will not have port down LLF fault propagation, because this would disconnect the incoming timing feed, that is used for the other services. LLF direction from B→A will not be offered on the access ports that take in sync timing feed.

3.10 Ethernet traffic

The Street Access 1000Mbps service is capable of transmitting frames conforming to IEEE 802.3 [2] with frame sizes from 64 bytes to a maximum of 2000 bytes. This is to maintain compatibility with a number of frame tagging formats, including VLAN tagging as specified in 802.1Q [4].

Note: This service will transport 9000 byte frames, however as this is not yet a recognized Ethernet standard, Openreach will not validate usage at this level until such time as the IEEE provide an endorsement and published standard for jumbo frames and we have tested against it.

The service is transparent to VLAN tags and will forward VLAN tagged frames in the same way as standard (untagged) frames.

4. Environmental Specifications

4.1 General

The temperature and humidity range of the environment used to house the 1U Head end NTE must not exceed the following:

- Ambient housing temperature: 0°C to +40°C
- Relative humidity 5% to 95% (non-condensing)
- Variable Fan speed cooling

The dimensions of the 1U headend NTE are 443mm x 44.4mm x 220mm (W x H x D) Weight 5.6 kg.

The Temperature and humidity range of the environment used to house the street furniture mini-NTE must not exceed the following:

- Ambient housing temperature: -15°C to +65°C
- Relative humidity 5% to 100% (including condensing)
- IP67 rated once the installation is finalised with all connectors installed
- ETSI 300 019 class 3.5
- Passive Cooling
- The dimensions of the remote NTE are 100mm x 145mm x 65mm (W x H x D) Weight 0.75 kg.

NOTE: The remote NTE must not be exposured to direct sunlight, so must be, for example, mounted within Street Furniture.

5. Power Supply & Installation

5.1 General

By placing an order, the CP has accepted the conditions placed by Openreach in relation to providing power, as defined below.

In relation to powering of equipment, the CP must comply with the requirements of BS7671 [1] and the details given within the "DC Power Planning and Installation Guide for WES-BES Products' document.

5.1.1 Headend NTE

The Openreach Head end 1U NTE is locally powered and offers AC or DC power options. The CP will be required to provide either dual local 50Hz AC supply in the form of standard 13A power socket(s); or dual -50 V DC power distributions and Earth connections, with all wiring colour schemes conforming to BS7671. It will be the CP's responsibility to ensure that the power supplies are fused and safe for Openreach to use. These should be in close proximity to the NTE installation location.

5.1.2 Remote end NTE

The Openreach Mini-NTE is locally powered in the street furniture via an AC to DC converter that must provide a DC PSU with a 40Watt capability, SELV source only.

For the Trial product Openreach will provida a DC power supply (PSU) which the CP is responsible for installing prior to installation of the remote NTE. The CP is also responsible for maintaining the PSU.

5.2 Installation and Testing

5.2.1 Headend NTE

In addition to the NTE powering requirements (i.e. AC or DC power as defined below) , a spare 50 Hz AC mains supply 13A socket should also be provided in close proximity to the NTE's to power Openreach test equipment during both initial commissioning and subsequent maintenance support activities. A 50 Hz mains supply 13A socket should also be provided in close proximity to the NTE for the management router.

5.2.2 AC Power connection – Head end NTE only

AC power connection between Openreach 1U Head end NTE equipment and the power socket will be made using a power lead fitted with a standard 13A plug. The NTE itself has dual power supply units internally, and requires two AC mains supply sockets running off the same phase.

For most installations, this will require two mains connections for each NTE provided, and the consumption of the Openreach NTE in this managed service arrangement will typically be 63W per NTE. An additional AC mains supply socket will be required for the management router.

5.2.3 DC Power Connection – Head end NTE only

The DC in-Line (Molex) connector is specified as the standard method of connecting DC power by Openreach, and represents the "Demarcation Point" between Openreach and the customer. At A end site the customer is required to provide suitable power and earth connection to, and be responsible for the supply, wiring and labelling to, the demarcation point. Openreach will not supply or install the DC distribution system as part of the standard Ethernet installation.

5.2.3.1 CP provided wiring up to the Openreach specified In-Line Connector

Wiring, MCB isolation or fuse (i.e. C type MCB or Cartridge Fuse) must be provided by the customer, up to and including the DC in-line connector, as per Openreach's requirements stated within the DC Power Planning and Installation Guide for WES-BES Products document with respect to;

i. Correctly rated MCB/Fuse (6A),

ii. Correct labelling of wiring and MCB/fuse positions compliant with BS 7671 [7] ,

iii. Correct size of cable for required voltage drop at required maximum current,

iv. Separately fused isolatable A & B power supplies, as detailed in the 'AC/DC Power Planning and Installation Guide' document.

An additional AC mains supply socket will be required for the management router. Currently the management router is AC powered only.

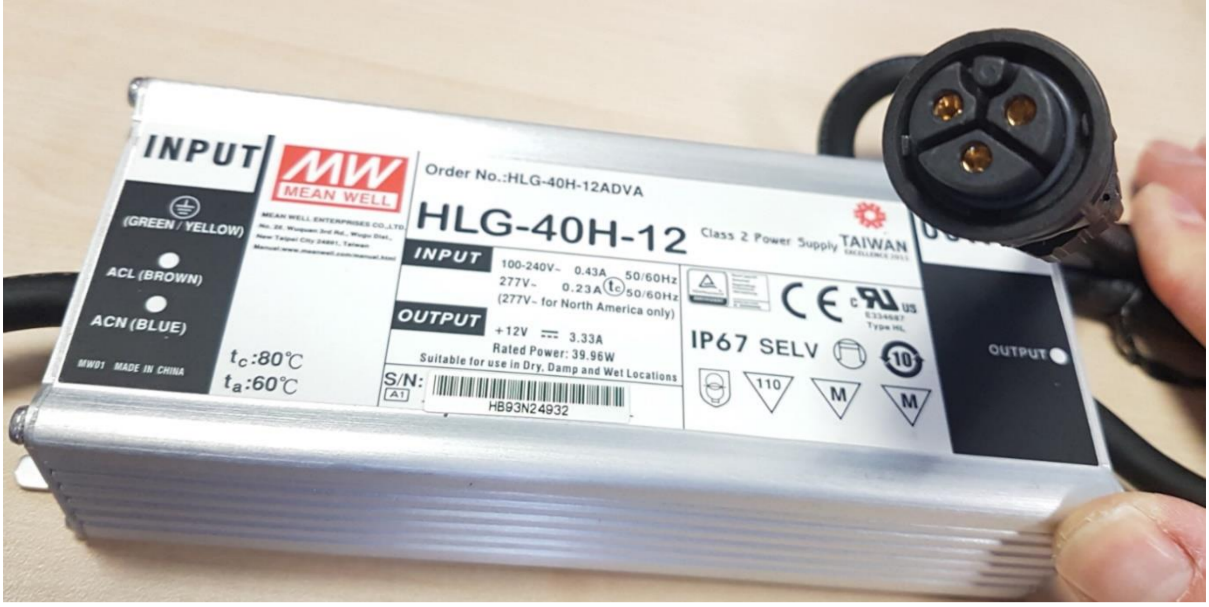
5.3 Remote End NTE used in street furniture only

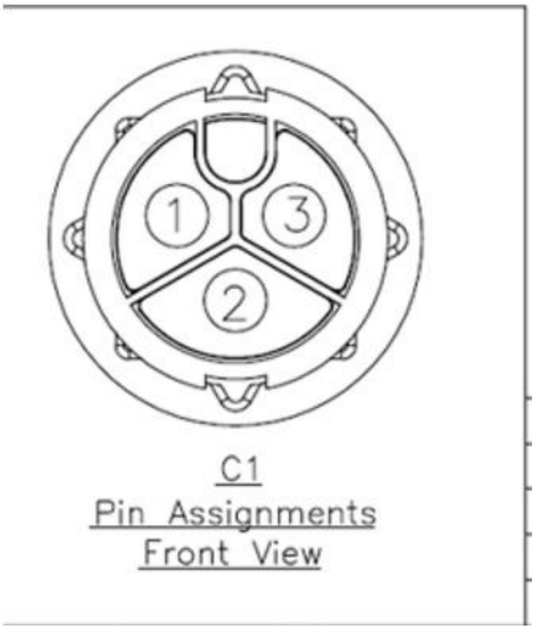
The Street furniture NTE must be earthed to ETSI EN 50310 standard, using the Earthing lead provided with the NTE or other lead of the same or larger gauge than the NTE.

It will be responsibility of the street furniture owner to ensure:

a) The furniture is earthed according to an acceptable standard ETSI EN 50310.
b) Any metallic exterior should be bonded to earth.
c) The earth is tested prior to connection of any Openreach equipment. Openreach will not connect unless the earth is proven to be good.

Post trial – The CP is responsible for providing the PSU to power the street furniture NTE (similar to below) and unmetered Supplies User Group (UMSUG) registered. The connector type for the 12V DC connection to the street furniture NTE is an Optitap connector as shown below:-


INPUT
MW MEAN WELL
(GREEN / YELLOW)
ACL (BROWN)
ACN (BLUE)
MW01 MADE IN CHINA
t_c:80℃
t_a:60℃
Order No.:HLG-40H-12ADVA
HLG-40H-12
Class 2 Power Supply
TAIWAN
INPUT
100-240V~ 0.43A 50/60Hz
277V~ 0.23A 50/60Hz
(277V~ for North America only)
OUTPUT
+12V 3.33A
Rated Power: 39.96W
Suitable for use in Dry, Damp and Wet Locations
S/N:
A1
HB93N24932
IP67 SELV
110
M
M
OUTPUT


1
3
2
C1
Pin Assignments
Front View

Pin out:

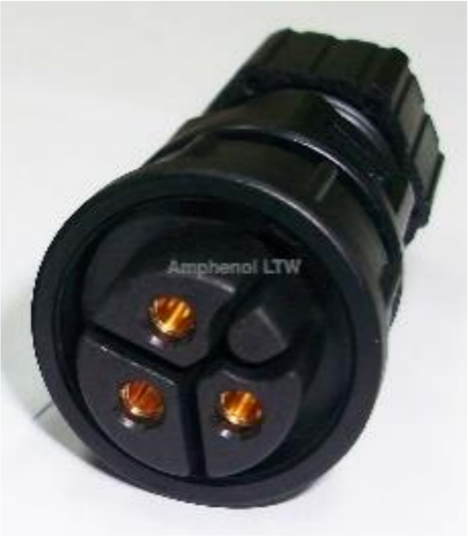
3 = +12V DC

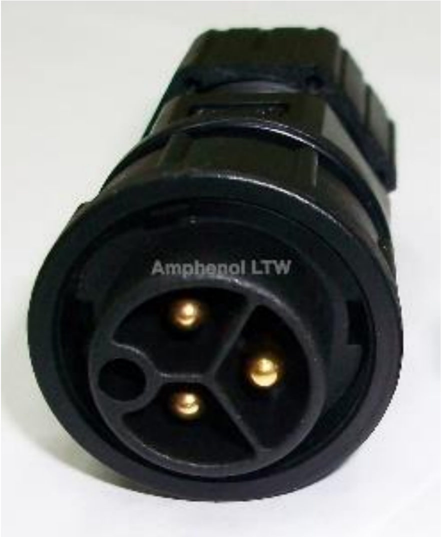
1 = -12V DC

2 = Ground

Required PSU female connector from Openreach NTE

Required PSU male connector from Customer





The PIN-out diagram for the electrical 12VDC PSU, refers to the female Amphenol LTW PSU connector from Openreach NTE

The applicable wire gauge for the DC feed is 2.5–0.75 sq. mm or 14–18 AWG. The earthing lead (ground wire) used on the mini-NTE must be a minimum of 16 sq. mm or 6 AWG.

The DC feed input should be protected by a 4.0 A to 5.0 A externally-mounted fast-acting fuse or equivalent when connected to a PSU capable of more than 40 watts.

The remote NTE is compliant to Electrical surge protection EN 61000-4-5 standard.

6. Synchronisation

For the headend NTE, Synchronous Ethernet (SyncE) with Precision Time Protocol (PTP) is a mandatory feature which will transport a clock source, provided by the CP, across the service to enable time and phase recovery.

Both features (SyncE and PTP) are either enabled or disabled. Customers cannot select to only take one feature without the other.

A maximum of two ports may be used for input clock feeds (i.e. a primary and a back-up feed) per headend NTE. Only a single input clock feed is supported on each line card. Therefore a back-up feed would require that a second line card is in slot 2 on the NTE. The back-up feed is only available to order when the customer places an order for the Fifth circuit. Only one timing domain is available per NTE per card.

The synchronisation output at the far end of the service will be on the Ethernet traffic port. At the local end - the back-up feed will only be used in event of failure of the primary clock feed from the CP. The CP will be responsible for providing and maintaining the timing source.

The BITS-In frequency port on the headend NTE is not supported.

The Street Access service supports Synchronous Ethernet as specified by ITU-T G.8261, ITU-T G.8262 and ITU-T G.8264 and Precision Time Protocol as specified by IEEE 1588v2 and ITU-T G.8275.1 Time and Phase Standard. Openreach Street Access product is a PTP aware Telecom Boundary Clock, supporting full on Path Support (SyncE ITU-T G.8261, ITU-T G.8262, ITU-T G.8264 and PTP ITU-T G.8275.1).

Street Access service does not provide the Primary Reference Time Clock (T-GM) or traceability back to the PRTC for both Phase/Time and Frequency traceability, but is only transporting Time and Phase with respect to the ITU-T G.8275.1 Telecom Profile standard.

It is the responsibility of the CP to provide Time and Phase Traceability back to their PRTC in their network. Traceability Flags are used as part of the PTP messages to convey status and indicate whether the T-BC is traceable back to the PRTC, or whether traceability has been lost. If the traceability flag indicates that the PTP flow is no longer traceable back to the PRTC, then this PTP Port/Flow would no longer be considered as valid reference input to the Openreach Equipment.

The standards that the Customer needs to adhere to are as below:

ITU-T G.8275.1

ITU-T G.8261

ITU-T G.8262

ITU-T G.8264

The ITU-T G.8275.1 Time and Phase Standard defines the full on-path protocol for the delivery of Frequency and Phase/Time. It is based on point to point Ethernet multicast communication between adjacent nodes (IP not supported by the profile).

There is a slight reduction in traffic throughput with SyncE and PTP enabled is expected. For example, where the link is used to transport 1G traffic, the maximum circuit throughput will be reduced from 999,680,000bps to 999,296,000bps, due to an additional 384kbps overhead for Sync traffic.

When G.8275.1 ITU-T T-BC is configured, 384Kbps of bandwidth is automatically allocated for the PTP Flow and all PTP Messages on all Ports that are participating in the T-BC configuration.

VLAN Tags shall not be used with the Boundary Clock PTP Flow (G.8275.1 uses Multicast) – regardless of traffic tagging. The CP shall send in PTP un-tagged to the headend NTE.

There will be no Openreach Portal available to the customer for the Street Access service. Additional alarm notifications to the customer are to be confirmed, but likely to include a “PTP clock time not traceable” alarm. Time holdover is expected to be at least 1 hour for Boundary clock. Frequency SyncE holdover may be a number of hours.

For this service, Synchronous Ethernet (SyncE) with Precision Time Protocol (PTP) is a standard feature which will transport a clock source, input by the customer at the headend NTE end, across the service to enable time and phase recovery at the remote site NTE.

This product supports SyncE G.8261/2/4 on all traffic Interfaces.

Synchronous Ethernet

- ITU-T G.8261
- ITU-T G.8262 EEC Option 1 & 2
- ITU-T G.8264 ESMC (SSM-QL)

The service supports ITU-T G.8275.1 Telecom Boundary Clock T-BC.

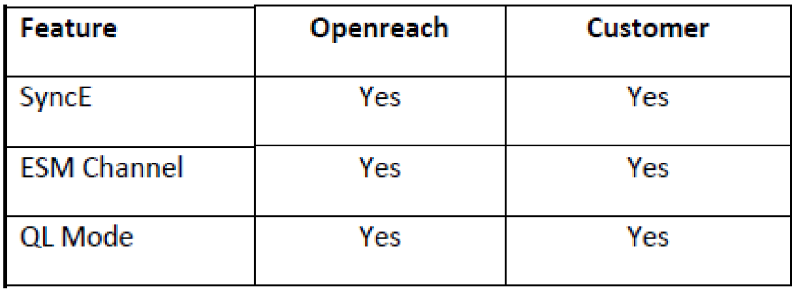
The 1000M street Access service will transport a clock input through the network to produce a matching clock output at the other end of the service. Providing and maintaining the timing source is the CP's responsibility. The service supports;

- Synchronisation at the Physical layer, ITU-T G.8261 [4]
- Supports clock requirements at as specified in ITU-T G.8262 [5]
- Supports messaging requirements as specified in ITU-T G.8264 [6]
- Multiple timing domains on the NTE are not supported

6.1 Timing Input Options

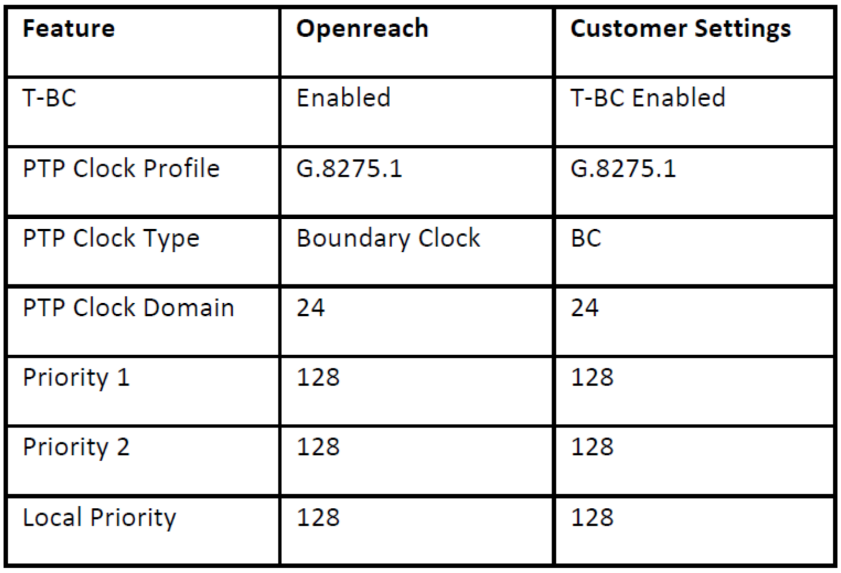
The customer traffic port is the only supported Synchronisation Input option. The first input should be fed by the customer in to circuit 1 (upper card slot – port 1). A backup timing feed (if the customer wishes to provide it) should be fed into the lower card slot – port 1. The Synchronisation output will be on the traffic on all circuits on the remote NTE (RJ45 output).

SyncE

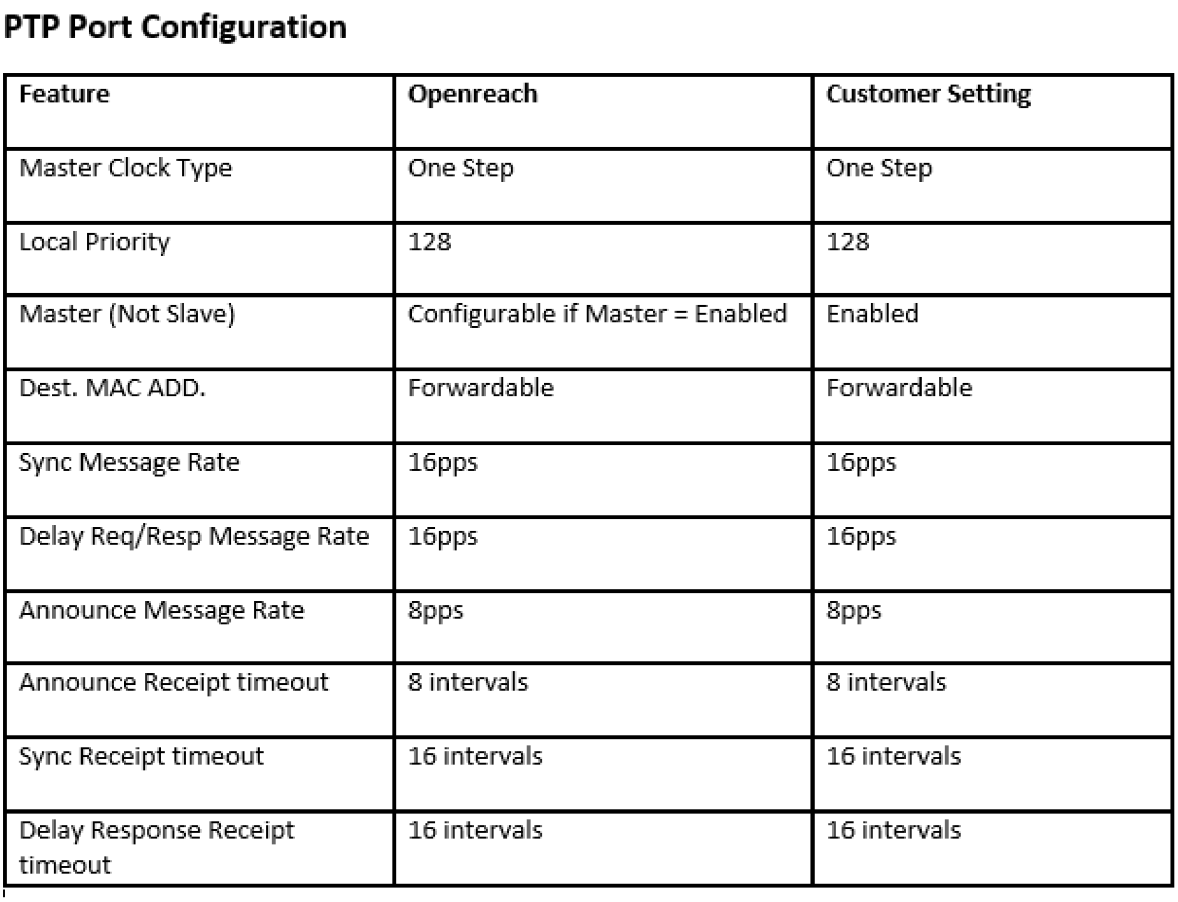


Feature	Openreach	Customer
SyncE	Yes	Yes
ESM Channel	Yes	Yes
QL Mode	Yes	Yes

PTP Telecom-Boundary Clock Configuration



Feature	Openreach	Customer Settings
T-BC	Enabled	T-BC Enabled
PTP Clock Profile	G.8275.1	G.8275.1
PTP Clock Type	Boundary Clock	BC
PTP Clock Domain	24	24
Priority 1	128	128
Priority 2	128	128
Local Priority	128	128



PTP Port Configuration

Feature	Openreach	Customer Setting
Master Clock Type	One Step	One Step
Local Priority	128	128
Master (Not Slave)	Configurable if Master = Enabled	Enabled
Dest. MAC ADD.	Forwardable	Forwardable
Sync Message Rate	16pps	16pps
Delay Req/Resp Message Rate	16pps	16pps
Announce Message Rate	8pps	8pps
Announce Receipt timeout	8 intervals	8 intervals
Sync Receipt timeout	16 intervals	16 intervals
Delay Response Receipt timeout	16 intervals	16 intervals

Openreach Street Access Phase/Sync service conforms to the Class A T-BC clock as per G.8273.2 and has a max absolute time error of 100ns per NTE.

Therefore the Openreach service max absolute time error is 200ns.

7. References

Standards:

[1]	IEEE 802.3	Standards specification for Ethernet, physical communication in a local area network (LAN)
[2]	IEEE 802.1Q	Standard that supports virtual LANs (VLANs) on an IEEE 802.3 Ethernet network
[3]	ETS 300 019	European standard for Environmental Engineering (EE); Environmental Conditions and Environmental Tests for Telecommunications Equipment
[4]	ITU-T G.8261	ITU standard for Timing and Synchronization Aspects in Packet Networks
[5]	ITU-T G.8262	ITU standard relating to Requirements for timing devices used in synchronizing network equipment that uses synchronous Ethernet
[6]	ITU-T G.8264	ITU standard for Distribution of timing information through packet networks and initially focuses on Ethernet networks.

British Standards:

[7]	BS 7671	(IET Wiring Regulations) sets the standards for electrical installation	

For information on where to obtain these referenced documents, please see the document sources list at https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do

8. Abbreviations

AWG	American Wire Gauge – standardised wire gauge for electrical conductors
CP	Communications Provider
CPE	Customer Premise Equipment
IPR	Intellectual Property Rights
RJ45	Registered Jack 45 – data jack that can be used for Ethernet connectivity
MCB	Miniature Circuit Breaker
NTE	Network Terminal Equipment.
NTP	Network Time Protocol
LC	Lucent Connector – Miniaturised version of SC connector with 1.25mm ferrule
SELV	Safety Extra Low Voltage (<=60V DC)
SIN	Suppliers Information Note
STIN	Suppliers Trial Information Note (BT Publication)
VLAN	Virtual Local Area Network

9. History

Issue	Date	Changes
Issue 1.0	August 2019	First issue
Issue 1.1	August 2020	Changes to branding, from BT to Openreach including changes to reflect new Openreach SIN site and Openreach SIN email address
Issue 1.1	July 2021	Annual Review – no changes required – issue remains unchanged.
Issue 1.1	July 2022	Annual Review – no changes required – issue remains unchanged.
Issue 1.1	July 2023	Annual Review – no changes required – issue remains unchanged.
Issue 1.1	August 2024	Annual Review – no changes required – issue remains unchanged.

-END-